



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
NEW ENGLAND - REGION I  
1 CONGRESS STREET, SUITE 1100 (HBT)  
BOSTON, MASSACHUSETTS 02114-2023

December 4, 2003

Lonnie Monaco (monacolj@efane.northdiv.navy.mil)  
Engineering Field Activity Northeast, Naval Facilities Engineering Command  
Code 1821/LM  
10 Industrial Highway, Mailstop 82  
Lester, PA 19113-2090

**Re: Direct Push Groundwater and Ash Landfill/Dump Area Delineation Investigation  
Summary Report for Site 9, dated October 2003 and the Monitoring Event #21  
Report for Site 9, dated October 2003, for the Naval Air Station Brunswick, Maine**

Dear Mr. Monaco:

Pursuant to § 6 of the Naval Air Station Brunswick, Maine Federal Facility Agreement dated October 19, 1990, as amended (FFA), the Environmental Protection Agency has reviewed the subject documents and comments are enclosed.

If you have any questions with regard to this letter, please contact me at (617) 918-1384.

Sincerely,

A handwritten signature in cursive script, appearing to read "Christine Williams".

Christine A.P. Williams, RPM  
Federal Facilities Superfund Section

cc. Claudia Sait/ME DEP ([claudia.b.sait@state.me.us](mailto:claudia.b.sait@state.me.us))  
Leann Jensen, EPA  
Ed Benedikt/Brunswick Conservation Commission e-mail only([rbenedik@zwi.net](mailto:rbenedik@zwi.net))  
Tom Fusco/BACSE e-mail only ([tfusco@zwi.net](mailto:tfusco@zwi.net))  
Carolyn LePage/LePage Environmental ([clepagegeo@aol.com](mailto:clepagegeo@aol.com))  
Peter Golonka/Gannet-Fleming e-mail only ([@gfnet.com](mailto:@gfnet.com))  
Darren Gainer/ECC email only ([dgainer@ecc.net](mailto:dgainer@ecc.net))  
Al Easterday/EA ([aeasterd@eaest.com](mailto:aeasterd@eaest.com))  
Tony Williams/NASB ([WilliamsA@nasb.navy.mil](mailto:WilliamsA@nasb.navy.mil))

## EPA COMMENTS ON SITE 9 DIRECT-PUSH DELINEATION INVESTIGATION RPT

### General Comments:

1. Results of the investigation are generally consistent with previous studies with respect to VOC contamination in both soil and groundwater. This investigation confirmed the presence of vinyl chloride in groundwater, but detected it at only one location, S9-B8 (14-18 ft bgs and 22-26 ft bgs, both at 7.1 micrograms per liter). These detections of VC are consistent with previous detections in shallow groundwater immediately downgradient, and appear to support the conclusion that the VC discharges upward to the impoundment pond. The current investigation also detected TCE and *cis*-1,2-DCE in groundwater at one location, S9-B6, 47-51 ft bgs, at 7.3 and 6.8 micrograms per liter, respectively. This discovery is consistent with the suggestion that the VC seen at the site is a degradation product of TCE. The soil investigation discovered only one, low-level detection of chlorinated VOCs, at S9-ASH-SB-2 (*cis*-1,2-DCE at 4 J micrograms per kilogram; VC at 15 micrograms per kilogram). The failure to discover TCE or its daughter products over a broader area or at higher concentrations supports the conclusion that Site 9 does not contain a significant continuing source of chlorinated VOCs.
2. Delineation of the ash appears to be good (e.g., Fig. 7). The ash is well constrained laterally by borings where none was encountered or by borings where less than one inch of ash was encountered. The disposal area proved to be considerably larger than previously believed, but ash appears to be a relatively small volumetric contribution to the total fill present.
3. Groundwater samples collected for this investigation were not analyzed for inorganics. However, soil analyses indicate high levels of some metals (e.g., Sb, Cu, Pb, Zn). Future groundwater monitoring for the site should pay special attention to metals concentrations and relevant geochemical conditions. Note that the most recently reported monitoring of site groundwater (Event 21, September 2002) shows antimony was ND in all three wells sampled and analyzed for metals, but the detection limit achieved by the laboratory was 20 micrograms per liter, well above the MCL of 6 micrograms per liter. Therefore, it is not known whether or not site groundwater meets the MCL for Sb.
4. Inorganics analyses on site soils reveal domains with elevated metals, some of which are not typically associated with coal ash at the observed concentrations (e.g., Sb, Cu, Pb, and Zn). Other potential source(s) should be considered as a conceptual model for the site evolves. Please see related Specific Comments.
5. The study concludes that "... possibly dioxins should be considered potential contaminants of concern ..." This conclusion is based on the analysis of one soil sample (S9-ASH-SB-2-8-16) for dioxins. Results indicate an exceedance of residential and industrial EPA Region IX PRGs. A single sample and analysis is inadequate to support decisions regarding "... removal, transport, and future disposal." Further discussions should be held regarding the necessity for additional

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delineation of dioxins.

### Specific Comments:

6. **p. 3, Sec. 2.1.1:** The last sentence on this page states that “[N]o soil samples were collected for laboratory analysis.” Although it becomes clear later in the report (sec. 2.2) that a few soil samples collected in vicinity of Buildings 218 and 219 *were* analyzed in the lab, the statement here seemed at first to be in contradiction to the introductory text (e.g. p. 1, sec. 1.1). For clarity, the sentence quoted above might be expanded to read, “No soil samples were collected for laboratory analysis in this portion of the investigation.”
7. **p. 4, Sec. 2.1.2:** *typo?* The first paragraph of this section refers the reader to Section 2.1.2 for a description of the soils investigation. Should this refer to Section 2.1.1?
8. **p. 5, Sec. 2.1.2:** Groundwater samples collected in this investigation were analyzed only for VOCs, in keeping with the objective to constrain better the extent of and possible source of chlorinated VOCs observed previously. However, the soil analyses performed for this investigation revealed relatively high concentrations of several inorganics (e.g., antimony, copper, lead, and zinc), raising the question of potential impacts to groundwater. Please note that future monitoring of site groundwater may require close scrutiny of metals and the geochemical conditions controlling their mobility.
9. **p. 9, Sec. 3.1.1:** This section presents an excellent overview of the site geology, and gives a good description of the major stratigraphic units underlying the site, as illustrated by the three cross sections (Figures 3 through 5). It is agreed that the Presumpscot Clay appears to exert significant control on the flow and transport of contaminants in the overlying outwash sands. Please expand upon the statement suggesting that “...the area immediately to the west of the Site 9 study area may represent a potential source for VOC...” What data from this or previous investigations support this interpretation? Does this refer to the discovery of TCE and *cis*-1,2-DCE at S9-B6, as well as historical detections of CVOCs at MW-NASB-227, along with the inferred flow direction from the WNW in this vicinity?
10. **p. 9, Sec. 3.1.1:** Please define the “galley area” for readers unfamiliar with the site landmarks.
11. **p. 13, Sec. 3.3.2:** A number of trace metals found in the Ash Landfill/Dump Area soil borings are listed under the 4<sup>th</sup> bullet, and additional inorganic constituents from these samples are shown in Table 3. Because many of these are relatively easily mobilized to groundwater under commonly occurring pH and redox conditions, future groundwater monitoring at the site should give special attention to the fate and transport of metals.

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**12. p. 13, Sec. 3.3.2:** Results are summarized for metals in soils. It is noted that only seven samples were analyzed for inorganics, from among the 30 borings advanced in the area of Buildings 218 and 219. These samples apparently were selected specifically to characterize the ash-like material (e.g., p. 6, sec. 2.2). Nonetheless, the analytical results show some startlingly high concentrations of antimony, copper, lead, zinc, and other metals. Maximum concentrations detected were: 2050 mg/kg Sb, 3030 mg/kg Cu, 1440 mg/kg Pb, and 3500 mg/kg Zn. These concentrations appear to be too high to be explained readily by the combustion of typical coals. For example, analyses by the USGS of Argonne Premium Coal, adjusted for its ~10% ash content, show Sb in the range ~1-10 mg/kg; Cu ~50-200 mg/kg; Pb ~10-100 mg/kg; and Zn ~50-2000 mg/kg (Palmer, C. A., ed., 1997, *The Chemical Analysis of Argonne Premium Coal Samples*, USGS Bulletin 2144). Are there historical records that indicate the nature of other materials that might have been disposed of in this area? (The report notes that ash appears to account for only about 5% of the total volume.) In particular, the presence of antimony and lead in relatively high concentrations suggests possible disposal of projectiles (e.g., bullets), and the presence of copper and zinc is suggestive of brass (e.g., shell casings). It is noted that the concentrations of antimony and lead in site soils analyzed are linearly correlated, suggesting that they have a common source. Furthermore, these elements do not correlate linearly with iron, which is atypical of the behavior of other elements whose concentrations are controlled by naturally occurring geochemical processes (cf, As, Cr, and Mn from the same suite of samples, which correlate strongly with iron).

## **EPA Comments on the Monitoring Event 21 (9/02) Report for BNAS Site 9**

### **General Comments:**

1. Event 21 was successfully executed, and yielded groundwater samples of good quality (e.g., field parameters stabilized during purging, turbidity was consistently low, etc.).
2. Groundwater analytical results obtained from the diffusion samplers are generally comparable to results from samples collected via the standard EPA low-flow procedure. An obvious exception is seen in the analyses for acetone, which consistently show detections of the order of 30 micrograms per liter for the diffusion samplers, and ND (<10) micrograms per liter for the low-flow samples. It seems reasonable to speculate that the acetone detected in the diffusion samples is an artifact of the sampler preparation or materials used. Field parameters measured in the wellbores also appear to be comparable to those obtained in the low-flow procedure (see related Specific Comment). Please note that the field parameters are essential data for assessment of the fate and transport of both organics and inorganics, both of which can, for example, be strongly affected by redox conditions. If Navy proposes in the future to rely increasingly on diffusion sampling to monitor VOCs, a reliable protocol for obtaining the field parameters must be developed.
3. The success of the diffusion sampling is encouraging with respect to monitoring VOCs in groundwater. Has consideration been given to testing the method for monitoring inorganics? Given that Site 9 has both VOC and inorganic COCs, it would be cost-effective to utilize a single sampling method for both.
4. It is noted that the detection limits achieved by the laboratory for some inorganics are higher than the MCLs that serve as nominal reference values (e.g., Sb: MCL = 6 micrograms per liter, detection limit = 20 micrograms per liter; Tl: MCL = 2 micrograms per liter, detection limit = 5 micrograms per liter). This is particularly important for antimony, which was found to be present in site soil samples at rather high concentrations (e.g., maximum 2050 mg/kg in the Ash Landfill / Dump Area Delineation Investigation). Given a known source within Site 9, it is important to quantify dissolved antimony in order to assess the impacts of the waste material on groundwater quality. Navy should request of the analytical laboratory detection limits lower than the MCL for antimony in future monitoring rounds.

### **Specific Comments:**

5. §1.2.2, Results, The Navy must institute the corrective actions agreed to for field procedures at sites 1&3 Landfills. It is inexcusable to have missed gauging a well entirely. At the end of the day the field supervisor should go over the field notes with the crew and check the data & the status of appropriate institutional controls. If there are discrepancies, the Navy (and EPA and DEP depending on the issue) must be notified immediately so that corrective action can be

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implemented.

6. §1.6, Visual Inspection, The Navy must institute the corrective actions agreed to for field procedures at sites 1&3 Landfills. It is inexcusable to have a hasp broken from before April 2002 to now, December 2003. At the end of the day the field supervisor should go over the field notes with the crew and check the data & the status of appropriate institutional controls. If there are discrepancies, the Navy (and EPA and DEP depending on the issue) must be notified immediately so that corrective action can be implemented.

7. §2.2.2.1, Volatiles, Why is it considered normal to have major spikes at this Site? Please provide some probable explanation, such as excessive rainfall or drought, construction changes to the infiltration upgradient, etc.

8. **p. 2, Sec. 1.3.1:** The text states that water quality parameters were collected "...immediately following removal..." of the diffusion samplers from the monitoring wells. Were the wells purged prior to measurement of the field parameters, or were these measurements made after samplers were withdrawn, without purging? Please clarify.

An in-well YSI 600XL meter was used to record water-quality data after removal of the diffusion samplers, while a flow-through cell was used to collect water quality data obtained via low-flow sampling. It is noted here and in Table 4 that the in-well data report pH and dissolved oxygen results that were slightly higher and temperatures that were slightly lower than those from the flow-through cell. How much of this difference may be attributed to a difference in instruments (the flow-through cell and the in-well meter)? How much to differences in purging procedures? Differences in the parameters do not seem to be significant, other than temperature (higher in the purged wells) and one pH value (MW-NASB-075) that is significantly lower (4.20) in the in-well sampling. Note that the temperature may rise simply due to the working of the submersible pump.

9. **p. 4, Sec. 1.4.1, third bullet:** The text notes that the temperature of surface water and the seep was higher in Event 21 than in Event 20. It would help to guide the reader here if the text were to note that Event 20 was in March (assuming it was 6 months prior to Event 21), while Event 21 was in September, suggesting that surface temperatures are changing as expected.

10. **p. 8, Sec. 2.1:** The 4<sup>th</sup> bullet in this section suggests that shallow groundwater south of the pond is not linked to shallow groundwater north of the pond. Please expand on the basis for this statement. Is there adequate control on the vertical gradients to support this conclusion? Can underflow of the impoundment pond be ruled out?

11. **p. 8, Sec. 2.2.1:** The text notes that Eh measurements are "not required" by the monitoring plan, but were recorded "for informational purposes." Eh / ORP should be recorded in all future sampling, regardless of whether or not it is required, as the information is critical to any

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assessment of the fate and transport of either trace metals (e.g., are iron oxyhydroxides and sorbed elements stable?) or VOCs (e.g., are conditions favorable to reductive dechlorination?).

**12. p. 9, Sec. 2.2.2.1:** It is not clear what is meant by the statement that the increase in the vinyl chloride/total 1,2-DCE ratios indicates “increasing dechlorination.” An increase in this ratio shows only that vinyl chloride concentrations are increasing *relative* to 1,2-DCE. The concentrations of VC and DCE at a fixed monitoring point will evolve due to a number of transport processes, including advection, dispersion, sorption, and degradation, and these, in turn, may change as hydrological and geochemical conditions change. While it seems reasonable to suppose that the suite of CVOCs present is continuing to evolve through dechlorination, it is not clear that the VC:DCE ratio alone is diagnostic. Please clarify.

**13. p. 9, Sec. 2.2.2.1 and Figures 4 and 5:** Figure 4 shows VC:DCE ratios for 6 individual monitoring wells, and Figure 5 appears to show the sum of the concentrations in the six wells (in micrograms per liter) for both VC and DCE. The text comments on the fact that the total DCE and total VC appear to track one another. The inference is that “[d]echlorination of 1,2-DCE and the subsequent formation of vinyl chloride appear to be occurring at a similar rate.” It is noted that these two processes are identical (assuming all VC present is due to degradation of DCE), and their rates are necessarily of equal magnitude. Perhaps the transport processes that govern the DCE and VC concentrations are approximately in equilibrium, and variations in the parent TCE due to depletion of the source, advection, etc., are reflected in correlated variations in the DCE and VC.

**14. p. 9, Sec. 2.2.2.1:** This sentence refers to “...changing geochemical conditions at the Navy Exchange Service Station...” What changes are these, and how are they likely to have impacted groundwater chemistry at Site 9? Please clarify the nature of these changes, along with an explanation for the underlying cause (e.g., decreasing ORP due to BTEX degradation?) and explain the nature of the downgradient effects (e.g., more favorable conditions for reductive dechlorination of TCE?).

**15. p. 9, Sec. 2.2.2.1:** Figure 5 shows what appears to be a persistent trend of decreasing DCE and VC in the last several rounds of sampling. What explanation might Navy offer to shed some light on this observation?

**16. p. 11, Sec. 2.2.2.2:** The text notes that Mn decreased in MW-NASB-069 since the last round, but is still in exceedance of the Federal drinking water standard. It is noted that the ORP recorded for this well in Event 21 is 74 mV. It may be worthwhile to review historical ORP and Mn data to help rationalize changes in Mn concentration. Also, please note that the drinking water standard for manganese (50 micrograms per liter) is posted by EPA as a “secondary” standard (i.e., a “non-enforceable guideline”), rather than a MCL.

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17. **p. 11, Sec. 2.2.2.2:** It appears that discussion of results for Cd and Cr is fragmented in this paragraph. Please check text editing.
18. **p. 12, Sec. 2.2.2.2, second bullet:** *typo* Please change “excellence” to “exceedance.”
19. **p. 13, Sec. 2.4:** *typo* Please change the units reported for VOC concentrations in sediment from micrograms per liter to micrograms per kilogram. Please note also that the footnote on Table B-6 (analytical results for sediment), states “Units are micrograms per liter (µg/Kg).” Please revise for consistency.
20. **Table B-3,** Please be advised that the MCL for Arsenic has changed from 50 ppb to 10 ppb. Comparisons should be done accordingly.